5. On Specimens of *Haliaetus pelagicus* and *H. branickii* now living in the Zoological Gardens of Hamburg. By Heinrich Bolau, Ph. D., Director of the Hamburg Gardens, C.M.Z.S.

[Received February 6, 1892.]

On Dec. 12th, 1882, we received as a present from Capt. Häveker a very fine specimen of *Haliaetus pelagicus*, the Giant Sea-Eagle, which he had brought from the Amur River in Eastern Asia. This bird is still in our possession, and is, I believe, the first of the species that has ever been received alive in Europe. On Feb. 6th, 1887, a second specimen of a giant *Haliaetus* from Eastern Asia was presented by Capt. B. Dethlefsen, who had brought it from Corea. This bird was so much like the first one—except especially in the want of the white patch on the shoulders—that I long thought it a young of *Haliaetus pelagicus*. I expected it would get the white shoulder-patches after some time and turn out to be a true *H. pelagicus*; but year after year elapsed and no change took place.

Last summer, when Dr. R. Bowdler Sharpe visited our Gardens, I told him about our birds and communicated to that excellent ornithologist my observations about our Corean bird. A short time after, Dr. P. L. Sclater asked me about our two *Haliaeti* and directed my attention to the new species *Haliaetus branickii* of Taczanowski, described in his "Liste supplémentaire des Oiseaux recueillis en Corée par M. Jean Kalinowski" (P. Z. S. 1888, p. 451).

I compared my bird with the description given by Taczanowski, and was at once convinced that our Corean bird belongs to the new species.

I now send for exhibition exact figures of our two birds, carefully taken from life, and the following short descriptions of them.

The Corean Sea-Eagle (*Haliaetus branickii*) is of a deep dull slaty-black colour, which inclines to brown only in certain reflexions of light; the streaks of the feather-shafts on the neck are somewhat lighter. The upper and under tail-coverts, the shoulders, and the thighs are black, and only the tail is white. The bill is not very different from that of *Haliaetus pelagicus* except in colour. The bill and feet of *H. branickii* are less yellow than those of the other species.

The Giant Sea-Eagle (*H. pelagicus*) is decidedly brown-black; besides it is at once to be distinguished from *H. branickii* by its shoulder-patches, thighs, and upper and under tail-coverts being white, so much so that the whole hinder part of our beautiful bird is of a white colour.

The iris of *H. pelagicus* is pale yellow, that of *H. branickii* of the same colour, but many delicate streaks make it somewhat darker. In both species the margin of the upper eyelid is bare and yellow like the bill; but in *H. branickii* the bald streak is more distinct than that of *H. pelagicus*.

In the plumage of the lores our birds are not quite so different as would appear from Taczanowski's description above referred to; probably these differences vary according to age or sex. Both our birds have the lores delicately feathered, but the bristle-feathers of *H. branickii* are lighter than those of *H. pelagicus*.

H. pelagicus and *H. branickii* are the largest of all the Eagles. Both our birds live, together with many other Eagles and birds of prey, in a large cage of our Eagle-house. When at rest they are generally to be seen sitting close together; their cry is in correspondence with their giant size, much louder and more penetrating than that of all the other Eagles.

March 1, 1892.

Dr. A. Günther, F.R.S., Vice-President, in the Chair.

The Secretary read the following report on the additions to the Society's Menagerie during the month of February 1892 :—

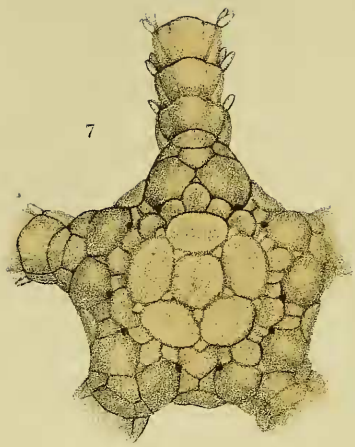
The total number of registered additions to the Society's Menagerie during the month of February was 84, of which 37 were by presentation, 7 by birth, 30 by purchase, 4 were received in exchange, and 6 on deposit. The total number of departures during the same period, by death and removals, was 75.

Amongst these special attention is called to the following :—

1. Two Short-winged Tyrants (*Machetornis rixosa*), purchased Feb. 15. These are the first examples of this bird that have reached us.

2. A female Beatrix Antelope (*Oryx beatrix*) from Arabia, presented by Lt.-Col. Talbot, Feb. 18. The pair of this Antelope presented by Col. Ross in 1890 being still alive, the receipt of another female makes a very acceptable addition to our series.

Mr. J. Graham Kerr gave a short account of the late Captain John Page's expedition up the Rio Pilcomayo, which he had accompanied as Naturalist upon the recommendation of the Council of this Society. Leaving England in the summer of 1889, Mr. Kerr spent some months studying the Zoology of the Pampas. In January of 1890 he left Buenos Aires in the steamship 'Bolivia,' which had been specially constructed for the expedition, and after several weeks spent on the Paraná, and a short preliminary trip up the Bermejo River, entered the Pilcomayo in March of 1890. Rapid progress was made for the first few days—the river being, although intensely tortuous, comparatively broad and unobstructed. The banks were here covered with thick and almost impenetrable forests, chiefly of small scrubby trees, and characterized by a great paucity of animal life. The most conspicuous mammals were :—the Carayá Monkey (*Mycetes caraya*), troops of which were to be seen in the trees by the river-side; the Mirikiná (*Nyctipithecus trivirgatus*), of which some half a dozen specimens were killed; the Tapir (*Tapirus americanus*), the tracks of which were to be seen in all directions;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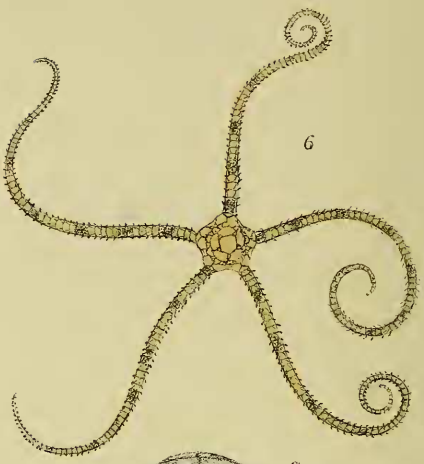
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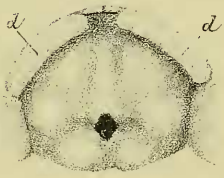

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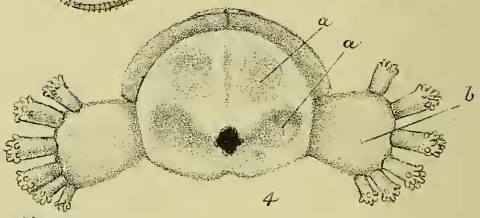

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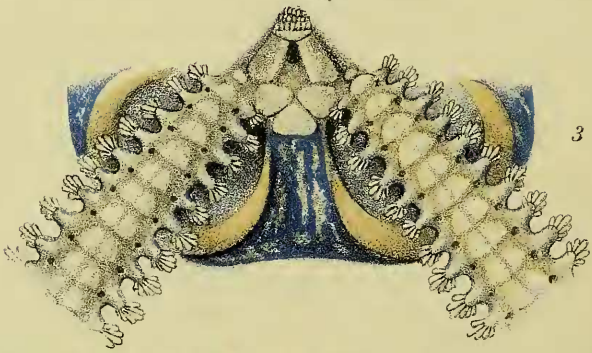
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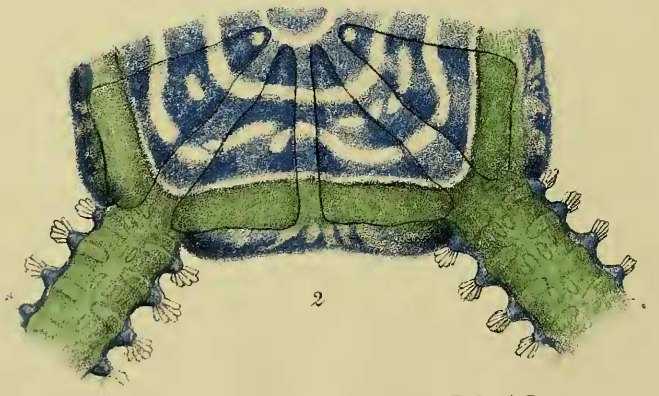
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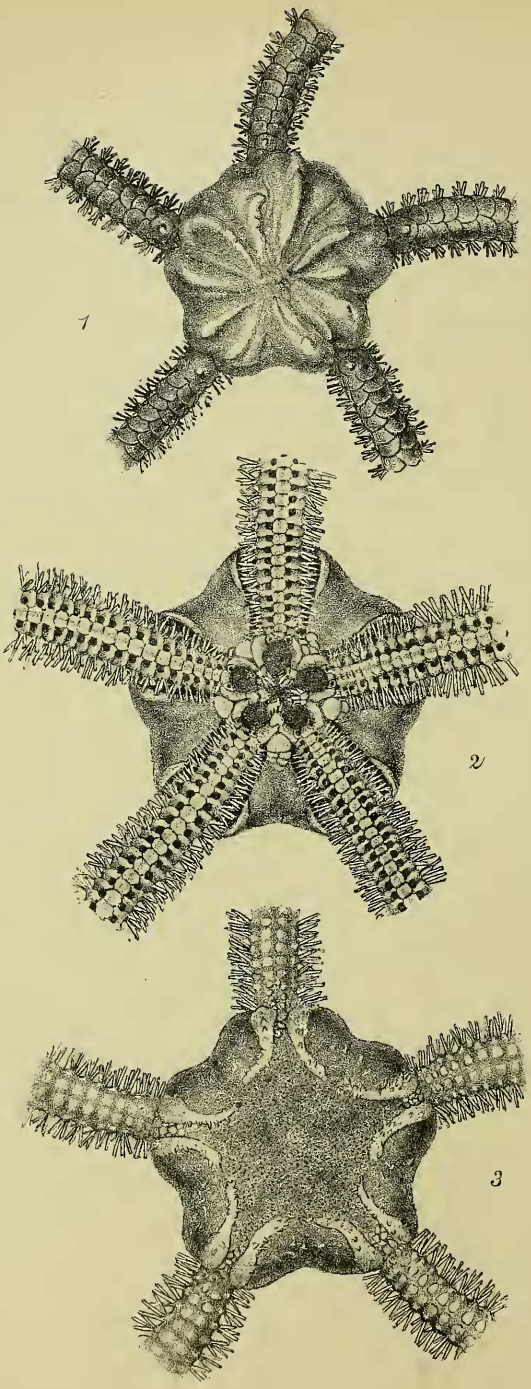
Barjeau & Highley del. et lith.

NEW OPHIUROIDS.

Hanhart imp.



Bergeau & Highley del. et lith.

Hanhart imp.

NEW OPHIUROIDS.

two species of Deer—*Cariacus paludosus*, frequenting the open marshy spots, and *Cariacus simplicicornis*, inhabiting the woods; and two Peccaries (*Dicotyles torquatus* and *D. labiatus*). Of Carnivora, the Jaguar was the most frequently seen; the Puma being equally abundant but less conspicuous, owing to its inhabiting the open campo. In the waters of the river near the mouth an Otter (*Lutra paranensis*) was abundant.

As the expedition proceeded farther up the Pilcomayo, the channel became narrower, and a great fall in the level of the water taking place, progress became much obstructed. Still, however, the 'Bolivia' struggled to get onward, but eventually came to a full stop about 300 miles from the mouth of the river, in the midst of a parched and salt-saturated country, consisting almost entirely of open campo, in which animal and vegetable life of all kinds was marked by extreme poverty and lack of variety. The greater part of the men here deserted, the leader and the doctor both died; and the remainder, numbering nine in all, after a detention of over four months, were ultimately rescued by a military search-party sent out by the Argentine Government. Mr. Kerr was compelled to leave the steamer 'Bolivia' in the Pilcomayo, and with it the greater part of his collections. The more portable portions—the bird-skins and the plants—were brought off on mule-back. The birds have been worked out, and an account of them has been published in the 'Ibis' for January 1892; while the Botanical collections are being investigated at Kew.

In illustration of his remarks, Mr. Kerr exhibited a series of 14 views taken from his own negatives, representing the progress of the expedition, and the life of the district traversed by it.

The following papers were read:—

1. A Contribution to the Classification of Ophiuroids, with Descriptions of some new and little-known Forms. By F. Jeffrey Bell, M.A., Sec. R.M.S.

[Received February 15, 1892.]

(Plates XI. & XII.)

1. The Calycinal Plates of a young Ophiurid.

Among the valuable collections recently made by Messrs. J. J. Walker, R.N., and P. W. Bassett-Smith, R.N., of H.M.S.'Penguin'[1],

[1] Forwarded to the British Museum through the Hydrographer.

on the north-west coast of Australia, are a number of young Echinoderms; in many cases it is not possible to assign them a definite specific place, but to the morphologist they will offer charms less patent to the systematist.

Among them there is an Ophiurid which is remarkable for the large size of what are now generally regarded as the plates of the calycinal area, and which my lamented friend P. Herbert Carpenter in his valuable essay [1] called respectively centro-dorsal, under-basals, and radials. These plates are so well marked that it is quite impossible for the most sceptical to regard them as anything else than the components of a vestigial calyx, and I think their relations to the rest of the organism are perhaps better shown in the drawing given herewith than in any previously published figure of an Ophiurid (Plate XI. figs. 6, 7).

It is certain that the specimen is the young of a species of *Pectinura* or of some form closely allied to that genus.

2. Classification of Ophiuroids.

Since the year 1867, when Dr. Ljungman [2] published his still valuable classification, no serious attempt has been made to classify the Ophiuroidea, and it is possible that some doubts remain as to the relations of the genera that compose that class; the question whether the simple-armed *Ophioderma* or the much-branched *Astrophyton* has the more archaic characters is one which systematists have neither asked nor answered. The majority of naturalists would probably confess that their impression was that the many-branched forms had succeeded those with simple arms.

At any rate all are agreed that there are two equivalent orders or groups—the Ophiuræ and the Euryalæ of Johannes Müller, the Ophiuridæ and Astrophytidæ of Theodore Lyman; if these two groups are really sharply separated from one another, it will follow that we must look upon one as derived from the other and now separated from it by the disappearance of the connecting-links, or we must suppose that they had long ago a common ancestor and have since been evolved along distinct lines; the latter is the view adopted by Prof. Haeckel in his 'Generelle Morphologie.'

Mr. Lyman, though retaining the bifid division of the class, recognizes the resemblance of some of the Ophiuridæ to the Astrophytidæ, for his "group III." is called "Astrophyton-like Ophiurans." One striking point in which *Sigsbeia* and *Hemieuryale*, for example, two members of the group, resemble *Astrophyton* is the power of rolling their arms. And the function has a corresponding similarity of structure. In most brittle-stars the "several ossicles of the arm have a certain power of movement on one another, but this is limited by the development of processes and pits analogous to the zygosphenes and zygantra of the Ophidian vertebræ. In such

[1] Quart. Journ. Micr. Sci. xxiv. (1884) pp. 1–23.

[2] Öfv. Vet.-Akad. Förhandl. xxiii. (1867) p. 303.

Ophiuroids, however, as are, like *Astroschema*, capable of twisting or twining their arms round a straight Gorgonian, the saddle-shaped faces are well developed, but the limiting pits and processes are absent" [1]. The former plan of structure may be spoken of as zygospondyline and the latter as streptospondyline; there can be no doubt that the latter is the simpler, and there is much evidence to support the view that this simplicity is archaic and not secondarily acquired. For example, no Astrophytid, all of which exhibit the streptospondyline type, has the investiture of the central arm-ossicles differentiated into upper, lower, and side arm-plates; the madreporites are inconstant in number and position, and pedicellariæ, never known among Ophiurida, may be present.

If the possession of streptospondyline ossicles is an archaic character in the Astrophytidæ, it is so also in the Ophiuridæ. Have any of them other archaic characters? *Ophioscolex* has no upper arm-plates; *Neoplax* has a single, incomplete, upper arm-plate; species of *Ophiomyxa* have or have not arm-plates, which, when present, may be in two pieces; the tentacle-scales, which are so characteristic of most Ophiurids, are wanting from *Ophiomyxa* and *Ophiobyrsa*, are small and single in *Neoplax*, small and narrow in *Ophiochondrus*; the teeth and teeth-papillæ of *Ophiobyrsa* are spiniform; and the teeth-papillæ are wanting in *Ophiomyxa*, *Ophiochondrus*, *Sigsbeia*, and *Hemieuryale*.

Such a combination of characters points to the forms just mentioned as the simpler of the class; they might have led to the vegetatively multiplying Gorgon's-head or to the more highly differentiated *Ophiothrix*.

Before coming to any definite opinion, let us consider the value of the evidence of the calycinal plates. But little is known of the development of any streptospondyline Ophiurid; indeed, all that we do know is, I think, contained in one passage in Mr. Lyman's 'Challenger' Report. There we read of the young *Gorgonocephalus* (p. 252): "Above there is in the centre a group of six or seven primary plates, each encircled by a superimposed line of grains." Later on, the "disk-plates" become obliterated. Mr. Lyman's observations show that there is no regularity of the plates, which, as he calls them primary, we may suppose to be the representatives of the calycinal plates of recent Echinoderm Morphology.

But, after all, this is what may well be expected; now that we are, as I hope, delivered from the theory of the pelmatozoic [2] origin of the Echinoderms, we may go a step further and recognize, as the Cystidea teach us to do, that the calyx did not appear at once with all the diagrammatic regularity that it has retained during the manifold changes in name that its parts have suffered.

It is, then, among those Cystid-like forms in which a definite pentamerous arrangement was not permanently established [3] that we must seek for the ancestor of the Ophiurid. At present, palæonto-

[1] Bell, Comp. Anat. & Physiology, p. 316.
[2] See Ann. & Mag. N. H. viii. (1891) pp. 206 *et seq.*
[3] *Cf.* Bather, Quart. Journ. Geol. Soc. 1889, p. 166.

logists have no form known to them which gives any certain indication of Ophiurid affinities.

The considerations which I have urged will perhaps induce the student to regard the streptospondyline type as earlier than the zygospondyline. I have now to show how that type is modified.

Mr. Lyman has shown how the "Astrophyton-like Ophiurans" make an attempt to acquire the saddle-shaped ossicle of the Astrophytidæ; we have among the several genera various modifications of the type which is seen at its simplest in *Ophioteresis*.

3. Account of Ophioteresis elegans.

Among the specimens collected by Dr. Coppinger, of H.M.S. 'Alert,' while in the waters of the Western Indian Ocean, were some examples of a remarkable Ophiurid, the explanation of the structure of which was quite unattainable at the time when I was engaged in preparing a portion of the Report published by order of the Trustees of the British Museum, under the editorship of Dr. Günther, F.R.S.

Description of the General Appearance of a Specimen.

This form is particularly elegant in appearance, owing to the green colour of the upper surface of the arms and the margins of the disk, and the ornamentation by light, wavy, meandering lines of the central portion of the disk with its dark background. Below, the colour is pale yellow, except in the interradial portions of the disk, which are dark, and marked by white wavy lines. The contour of the disk, which is of moderate size in proportion to the arms, is more or less distinctly pentagonal; the regularity of the disk is, no doubt, due to the large size of the radial shields. These, however, are not apparent from the outer surface, for, like all the rest of the animal, they are enclosed in a thick softish skin. The oval slits are provided with teeth and tooth-papillæ, but there are no mouth-papillæ. The arms twist and coil on themselves; at their sides the spines form mere papilliform projections, owing to the fact that their bases are encased in the thick investing skin; on the middle line of their lower surface there is a distinct groove.

Anatomical Details.

Since the publication of Mr. Lyman's 'Challenger' Report, in which so many valuable figures were given of the characters of the ossicles of which the arms of various species of Ophiuroids are made up, every student of the group turns first to an examination of these parts of the skeleton.

Those of *Ophioteresis* are particularly interesting from the extremely generalized condition which they present. As will be seen from the drawings (figs. 4 and 5, Plate XI.), the recesses on the adoral side of the ossicle are excessively shallow, and, in correspondence with that, the articulating elevations on the aboral side are very slight and inconspicuous. But, at the same time, it is to be noted that

the saddle-shaped face of the Astrophytid ossicle is not seen here; we have merely a generalized Ophiurid ossicle, without knobs or pits.

The most remarkable character of this Ophiurid (see Plate XI. figs. 3 and 4) is the complete absence of a ventral plate; no other existing brittle-star is known to want this plate. The upper plates are definitely double, and the side-plates, instead of lying flat against the side of the central ossicles, are wider than long and stand out from the sides of the arm. The radial shields are very large and extend almost to the centre of the disk; they have the form of right-angled triangles, the hypothenuses of which face, but do not touch, one another; there are no other plates on the surface of the disk.

It is necessary to form a new genus for this form, which may be called *Ophioteresis* [1].

Definition of the Genus and Species.

Ophioteresis is a streptospondyline Ophiurid in which the covering-plates of the arms are double above, wanting below, and wedge-shaped at the sides; the radial shields are well developed, and there are ordinary teeth and teeth-papillæ.

Ophioteresis elegans has the disk more or less distinctly pentagonal, of moderate size; arm-spines five. Elegantly coloured, the upper surface of the arms and the margins of the disk green, the central portion of the disk dark, with an irregular pattern of meandering white lines; interradial portions of lower surface of disk dark, with white lines; the rest of the lower surface yellow.

Hab. Seychelles, 4–12 fms. In coll. B. M.

From this simple form differentiation would seem to have preceded along two lines; there has been an increase in complexity of articulation, associated with the fixation of certain ossicles and spines, or there has been vegetative repetition and branching with a more primitive inconstancy and irregularity of anatomical characters.

Around the primitive stock some forms—those which Mr. Lyman calls the "Astrophyton-like Ophiurans"—have remained, such as *Ophioscolex*, *Ophiobyrsa*, *Neoplax*, and *Ophioteresis*.

4. The Subdivisions of Ophiuroids.

It will perhaps be found convenient to give distinctive names to the three groups; for brevity's sake I add here the definition of Ophiuroids which I ventured to publish last September [2].

The Ophiuroidea are caliculate, actinogonidial, eleutherozoic, azygopodous Echinoderms, in which there is no distinct ambulacral groove. The "arms" are sharply marked off from the disk, are very rarely more than five in number, and are sometimes elaborately branched. The digestive system, which is aproctous, and the generative are confined to the area of the disk, as is also the specialized respiratory apparatus, which takes the form of deep clefts.

The Streptophiuræ are Ophiurids in which the ambulacral

[1] Τήρησις, alertness.

[2] *T. c.* p. 214.